

## REMARKS

### I. Introduction

In response to the Office Action dated January 4, 2006, no claims have been cancelled, amended or added. Claims 1-33 remain in the application. Re-examination and re-consideration of the application is requested.

### II. Double Patenting Rejection

On page (2) of the Office Action, claims 1-33 are provisionally rejected on the ground of nonstatutory double patenting over claim 1 and 3-30 of copending Application No. 09/669,556.

Applicant's attorney notes the provisional nature of these rejections, and will respond substantively to the rejections once allowable claims have been identified.

### III. Prior Art Rejections

#### A. The Office Action Rejections

On page (3) of the Office Action, claims 1, 3-6, 12, 14-17, 23 and 25-28 were rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent 6,434,545 (MacLeod). On page (5) of the Office Action, claims 2, 7-11, 13, 18-22, 24, and 29-33 were rejected under 35 U.S.C. §103(a) as being unpatentable over MacLeod in view of U.S. Patent No. 6,496,819 (Bello).

Applicant's attorney respectfully traverses these rejections.

#### B. The Applicant's Claimed Invention

Applicant's claimed invention, as recited in independent claims 1, 12 and 23, is generally directed to optimizing execution of a query that accesses data stored on a data store connected to a computer. Claim 1 is representative, and comprises the step of using statistics on one or more expressions of one or more pre-defined queries to determine an optimal query execution plan for the query.

#### C. The MacLeod Reference

MacLeod describes a user specifying one or more queries comprising a batch of SQL statements. Each query submitted is displayed and represented as a tree, with each operation in the execution plan for the query represented by a corresponding tree node. This representation intuitively conveys the DBMS execution strategy which would be used to process the queries. The

tree nodes are displayed as icons, with a unique one of such icons corresponding respectively to each of the possible query operations. In addition, the computing cost of each operation (each node) as a percentage of overall query cost is displayed, as is the cost of each query as a percentage of the overall cost of the specified query batch. A user may select an operation (tree node) with a conventional mouse, whereupon a user interface will show more detailed cost statistics relating to the selected operation.

#### D. The Bello Reference

Bello describes a method and system for processing queries. Specifically, techniques are provided for handling a query that does not reference a particular materialized view, where the query requires access to values from a particular column not contained in the materialized view. A technique is also provided for processing a query that does not reference a particular materialized aggregate view, where the materialized aggregate view specifies an outer join between a child table and a parent table and the query specifies a particular type of join between the child table and the parent table, where the particular type of join is one of an inner join, an anti-join and a semi-join. The query is rewritten to produce a rewritten query that accesses the materialized aggregate view to produce data required by the query. A technique is also provided for processing a query that does not reference a particular materialized view and that specifies that results are to be grouped by a first set of one or more columns, where the materialized view reflects data that is grouped by a second set of one or more columns. If each column in the first set of columns either exactly matches a column in the second set of columns, is functionally dependent on another column in the first set of columns, or is functionally dependent on a column in the second set of columns, then the query is rewritten to produce a rewritten query that references the materialized view.

#### E. Applicant's Claimed Invention Is Patentable Over The Cited References

Applicant's claimed invention is patentable over MacLeod and Bello, because it includes a combination of limitations not taught or suggested by the cited references.

Nonetheless, MacLeod is cited by the Office Action as teaching all of the steps or elements of independent claims 1, 12 and 23, as well as dependent claims 3-6, 14-17 and 25-28, while the combination of MacLeod and Bello is cited by the Office Action as teaching all of the steps or elements of dependent claims 2, 7-11, 13, 18-22 and 29-33.

Applicant's attorney disagrees.

Applicant's invention, as recited in the independent claims, uses statistics on one or more expressions of one or more pre-defined queries to determine an optimal query execution plan for the query.

MacLeod merely describes the use of statistics from tables stored in the database to determine an optimal query execution plan for the query. However, MacLeod says nothing about storing statistics on pre-defined queries, and using such statistics for query optimization.

Bello fails to overcome the deficiencies of MacLeod. Recall the Bello was cited only against the dependent claims. Further, Bello was cited only for describing the use of materialized views, which are tables stored in the database.

In contrast, Applicant's invention uses only the query expression and the statistics representing the result of executing that query expression, not the actual data resulting from executing the query expression.

Consequently, the MacLeod and Bello references, taken individually or in combination, do not teach or suggest Applicant's invention. Moreover, the various elements of Applicant's claimed invention together provide operational advantages over the cited references. In addition, Applicant's invention solves problems not recognized by the cited references.

Thus, Applicant submits that independent claims 1, 12 and 23 are allowable over MacLeod and Bello. Further, dependent claims 2-11, 13-22 and 24-33 are submitted to be allowable over MacLeod and Bello in the same manner, because they are dependent on independent claims 1, 12 and 23, respectively, and because they contain all the limitations of the independent claims.

F. Appellant's Dependent Claims Are Patentable Over The Cited References

In addition, Appellant's dependent claims are patentable over MacLeod and Bello, because they recite a combination of limitations not taught or suggested by the cited references, taken individually or in any combination

With regard to claims 2, 13 and 24, these claims stand or fall with claims 1, 12 and 23.

With regard to claims 3, 14 and 25, which recite "generating cardinality estimates for one or more query execution plans for the query using statistics of one or more of the pre-defined queries that vertically overlap the query," and "using the cardinality estimates to determine an optimal query execution plan for the query," the Office Action asserts that MacLeod teaches these elements at col. 7, lines 5-65. Appellant's attorney disagrees. At the indicated location, MacLeod merely states that an estimated cost for an operation in a query is determined during an optimization process, wherein the

estimated cost for the operation is displayed as a percentage of the cost of the query. However, nowhere does MacLeod describe the use of cardinality estimates generated using statistics of pre-defined query that vertically overlap the query. As noted in Appellant's specification, a pre-defined query vertically overlaps a query when the set of predicates applied by the pre-defined query is a subset of the predicates required by the query. However, there is no discussion of vertically overlapping pre-defined queries in MacLeod.

With regard to claims 4, 15 and 26, which recite that "the statistics are used to improve a combined selectivity estimate of one or more predicates of the query," the Office Action asserts that MacLeod teaches these elements at col. 8, lines 20-54. Appellant's attorney disagrees. At the indicated location, MacLeod merely describes the cost of a Table Scan, a Hash Match and scalar computations, the approximate cost of each query as a percentage of a batch total, and the display of the cost of each operation as a percentage of the total query cost. Nowhere in this portion of MacLeod is there a description of a combined selectivity estimate of one or more predicates of a query or using the statistics of the pre-defined query to improve the combined selectivity estimate of the predicates.

With regard to claims 5, 16 and 27, these claims stand or fall with claims 4, 15 and 26.

With regard to claims 6, 17 and 28, which recite that "the selectivity estimate comprises a ratio of a cardinality of the pre-defined query to a product of cardinalities of base tables referenced in the pre-defined query and the query," the Office Action asserts that MacLeod teaches these elements at col. 8, lines 15-55. Appellant's attorney disagrees. At the indicated location, MacLeod merely describes the cost of a Table Scan, a Hash Match and scalar computations, the approximate cost of each query as a percentage of a batch total, and the display of the cost of each operation as a percentage of the total query cost. Nowhere in this portion of MacLeod is there a description of a selectivity estimate that comprises a ratio of a cardinality of the pre-defined query to a product of cardinalities of base tables referenced in the pre-defined query and the query.

With regard to claims 7, 18 and 29, these claims stand or fall with claims 4, 15 and 26.

With regard to claims 8, 19 and 30, these claims stand or fall with claims 7, 18 and 29.

With regard to claims 9, 20 and 31, which recite "determining a subpredicate combined selectivity estimate of the unapplied eligible predicates using column distribution statistics of the pre-defined query," the Office Action asserts that Bello teaches these elements at col. 10, lines 30-36. Appellant's attorney disagrees. The indicated location in Bello merely describes determining whether a previously unselected materialized view is eligible for use in rewriting the received query. Nowhere in this portion of Bello is there a description of determining a subpredicate combined selectivity

estimate of the unapplied eligible predicates using column distribution statistics of the pre-defined query.

With regard to claims 10, 21 and 32, which recite that “a cardinality ratio comprises a ratio of a cardinality of the pre-defined query to a product of cardinalities of base tables referenced in the pre-defined query and the query,” the Office Action asserts that Bello teaches these elements at col. 10, lines 37-56. Appellant’s attorney disagrees. At the indicated location, Bello describes a query analyzer element that displays a tree structure corresponding to an execution plan for a query. Nowhere in this portion of Bello is there a description of a cardinality ratio comprises a ratio of a cardinality of the pre-defined query to a product of cardinalities of base tables referenced in the pre-defined query and the query.

With regard to claims 11, 22 and 33, which recite that “the selectivity estimate comprises a product of the subpredicate combined selectivity estimate and the cardinality ratio,” the Office Action asserts that Bello teaches these elements at col. 11, line 55 – col. 12, line 41. Appellant’s attorney disagrees. At the indicated location, Bello merely describes displaying a tree structure representation of the specified query, where each node is a query operation of an execution plan, each arrow representation has a width bearing a mathematical relationship to an execution cost for the node, and the query analyzer element displays the estimated cost, determined during the optimization process, for the current operation as a percentage of the cost of the query. Nowhere in this portion of Bello is there a description of a selectivity estimate comprising a product of the subpredicate combined selectivity estimate and a cardinality ratio.

#### IV. Conclusion

In view of the above, it is submitted that this application is now in good order for allowance and such allowance is respectfully solicited.

Should the Examiner believe minor matters still remain that can be resolved in a telephone interview, the Examiner is urged to call Applicant's undersigned attorney.

Respectfully submitted,

GATES & COOPER LLP  
Attorneys for Applicant

Howard Hughes Center  
6701 Center Drive West, Suite 1050  
Los Angeles, California 90045  
(310) 641-8797

Date: April 4, 2006

By: GHG

Name: George H. Gates  
Reg. No.: 33,500

GHG/

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